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ANALYSIS OF READING DIFFICULTY OF SELECTED NAVY MATERIALS

NICHOLAS A. FATTU
LLOYD S. STANDLEE

INSTITUTE OF EDUCATIONAL RESEARCH
INDIANA UNIVERSITY

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PREFACE

The present report, Analysis of Reading Difficulty of Selected Navy Materials, is a sub-task of contract Nonr-908(01), which is concerned with evaluation and improvement of training of marginally literate personnel in the Navy. The present report analyzes the readability of various Navy publications that enlisted men, in the lowest three pay grade levels, are expected to read.

Fourth-grade reading ability has generally been accepted as the minimal functional reading level. This criterion has been used by both the Army and the Navy. Present Navy literacy standards require that enlisted men be able to read at the fourth-grade level before beginning recruit training. Men who do not meet this criterion are given Recruit Preparatory Training (RPT). When RPT men are able to read at the fourth-grade level they are admitted into regular recruit training.

Few studies, however, have tried to determine if the fourth-grade level was really functional. The present study is an attempt to determine the reading difficulty of Navy publications that enlisted men, including the marginally literate, are expected to read.

In a conference with BuPers personnel, eight Navy publications were selected for readability analysis. Materials selected include:

The Bluejackets' Manual, which is a basic recruit training text; Stewardsman, Fireman, Steward and Cook 3c & 2c, and Commissaryman 3 & 2, which are training manuals for four of the Navy occupational groupings with low General Classification Test (GCT) requirements; This is Your Navy, which is collateral material for any level of instruction or information; All Hands, which is a house organ publication for all levels of Navy personnel; and the Naval Training Bulletin, which is written for instructor personnel These publications were judged to provide a representative sample of the sort of materials that an enlisted man in the lowest three pay grades should be able to read Study of reading difficulty should indicate whether marginally literate enlisted men could reasonably be expected to read these materials.

Results of the reading difficulty analyses indicate that all of the Navy reading materials analyzed were more difficult than the minimal functional, or fourth-grade, reading level These materials are too difficult for the marginally literate personnel who meet only the fourth-grade level criterion.

It may be that writers of these publications directed their efforts toward an audience of average recruits rather than the marginally literate Although the reading ability level of the average recruit does not seem to

be known, an estimate based on census data would place it slightly above the ninth-grade level. Even by this standard four of the eight publications were too difficult.

The last section of the report indicates that these Navy publications could be written in a more readable and interesting manner for the average, as well as the marginally literate, recruit. Rules for achieving this end are given, and an example illustrating how readability and interest level may be improved is presented.

The present report analyzes and presents data on the readability of eight Navy publications. It also devotes several sections to the discussion of clearer writing. The discussion of readability formulas, the review of studies using readability determinations, the suggestions and example for making writing more readable should help writers of Navy materials make their presentations more effective by bringing that writing within the reading ability of the enlisted men.

Nicholas A. Fattu
Principal Investigator

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INTRODUCTION

One of the perennial problems of any military organization is to train and direct its personnel in a lucid and economical manner. In recent years, two factors have made this problem even more difficult for the armed forces of the United States.

First, modern warfare requires a host of technical specialists. The complexity of the equipment the average enlisted man must operate, and the intricacy of the maneuvers he participates in seem to be ever increasing. This fact alone dictates an extensive educational program.

Second, the composition of the armed forces has changed. Prior to World War II, the Army and Navy were almost exclusively career jobs. Men enlisted and found permanent vocations within the military. At present, however, the operation of the selective service system results in the enlistment of a large number of men who enter service for a relatively short period of time. With the resulting rapid turnover of personnel, training becomes an extremely important activity.

Even with an efficient school system and a valuable on-the-job training program within the military organizations, the average enlisted man must assimilate a large quantity of his training from printed materials. If these materials are ineffective in communicating their messages to the man, this portion of his education must necessarily be incomplete and his value to the service restricted.

The relative effectiveness of a particular printed passage in

communicating to some specified audience is termed the readability of the material.

Reading, like other forms of communication, is an interactive process between the originator and the receiver of the message. Thus, what the reader understands of the material he reads depends upon characteristics of the reader as well as the readability of the material. The reader's general intelligence, education, environment, purpose, and interest in reading help to fix the level of comprehension.

The readability of a passage depends upon factors such as the following: (a) typography, including physical characteristics of letters and words (relative length of ascending and descending strokes, relative width of stroke, etc.) as reflected in type face and size, arrangement on the page, contrast between print and paper, length of line, and spacing between lines; (b) organizational features, including arrangement of thoughts, paragraph arrangement, and the use of organizational guides such as outlines, side headings and similar devices; (c) literary style, including vocabulary and complexity of sentence structure.

The factor of literary style is the one over which an author exercises the most direct control. Publishers, book designers, and printers assume responsibility for the typography of printed material; they share with the writer responsibility for the organizational features of the text. The choice of words and the manner in which they are used, however, rests

almost exclusively with the author.

The purpose of this study was to assess the readability of certain Navy publications which an enlisted man might be expected to read. Attention was restricted solely to items in a writer's province. Hereafter in this report, readability is used in a limited fashion to refer to readability due to literary style.

METHODS OF MEASURING READABILITY

Research in readability began with informal attempts to simplify children's books and to grade them for use in the elementary school. More recently, research workers have demonstrated the lack of suitable reading materials for adults, and suggested how more adequate materials might be prepared.

The basic quest of all readability research has been to find some relationship between the statistical structure of the verbal materials and some measure of the reader's actual difficulty in reading or remembering the contents. This has generated a dual problem, to establish a satisfactory criterion of readability and to isolate the predictors of readability.

Criteria of readability used in research work to date have fallen into two categories. First, a readable text is one that will insure high scores on a comprehension test if read by a given group of readers. For example, Lorge (97) used as a criterion, the grade level equivalent of scores for a group of readers who could get half of the test questions right on each passage in a standardized reading test. Second, a text is readable if a large number of readers judge it to be readable. Kitson (88), for example, assumed that the text in a high-brow paper was more difficult than the text in a low-brow paper and used this judgment as his criterion.

More novelty has been displayed in the search for the predictors of readability. (A predictor is a variable found in the printed material,

e.g., sentence length, word complexity, and human interest.) The predictors most frequently used can be reduced to four categories: word familiarity, sentence complexity, word complexity, and human interest.

Most of the early attempts to describe readability in a statistical manner were centered on the word familiarity approach. The basic reasoning here can be summarized in this way: Familiar words provide fewer obstacles to reading than do unfamiliar words; the greater the proportion of unfamiliar words in a given passage, the more difficult it is. During the 1920's several extensive word count studies were conducted. These word lists ranked words in order of frequency of occurrence in specified sources. By comparing the words in a given passage with such a word list, it is possible to arrive at a measure of familiarity, and indirectly, reading difficulty.

Another category of readability predictors is sentence complexity. This is based on the argument that long sentences are harder to read than short ones; intricate sentence structure is more difficult to follow than simple structure. Thus, such elements as average number of words per sentence, percentage of prepositional phrases, percentage of indeterminate clauses, and number of simple sentences have been used as predictors.

Parallel to the sentence complexity argument is a word complexity theme: Long words are harder to comprehend than short ones; words

formed by adding prefixes or suffixes are more difficult than the base words; abstract words are more difficult than concrete words. Attempts have been made to translate this reasoning into measurement procedure.

A less frequently used type of predictor is a measure of the degree of personal involvement in the reading. Material which is interwoven with references to the reader and people he knows (both real and vicarious) will be more interesting than material which remains impersonal. This idea is represented in some prediction formulas by counts of the relative number of personal pronouns, proper nouns, colorful words, words learned early in life, or sentences directed toward the reader in a passage of reading matter.

SIGNIFICANT ATTEMPTS TO PREDICT READABILITY

Everyone seems agreed that there is certainly more to English prose than sentence length, percentage of uncommon words, the number of prepositional phrases, and the number of personal references. However, there is also concensus that reading difficulty is related to such factors. There remains, then, only the pragmatic question. Which of the measures of the structure of the passage correlates best with a selected criterion of readability? A series of studies has considered this question.

Perhaps the first measurement of readability to use more than single word analysis was published by H. D. Kitson, in 1921 (88) He undertook to develop a psychological yardstick to measure certain attributes of the buying public so as to adapt advertising copy to the particular medium it was to appear in. He used counts of sentence length (in words) and word length (in syllables) to show quantitatively the difference between high-brow and low-brow writing.

In 1923, Lively and Pressey (95) tried to determine the vocabulary burden of a textbook by comparing the words in a thousand-word sampling with the words found in the Thorndike word frequency list of 10,000 words. The Thorndike list published an index of the relative frequency of occurrence of each word within a wide variety of children's literature. The Lively-Pressey method used the Thorndike indices to compute the weighted median index number for the passage.

Keboch (87) used a statistic based on the number of words listed in the second 5,000 words of the Thorndike list to study history texts.

Dolch (25) estimated the vocabulary burden of school books by counting the number of different words in the test and by gauging the familiarity of the vocabulary by comparison with a word frequency list.

Vogel and Washburne (151) were among the first to try to identify elements of a passage, other than vocabulary load, that correlated with reading difficulty. Their criterion for the readability of a book was the average reading grade score of children who read and liked that book. As predictors they settled on the number of different words, the number of different uncommon words, the number of prepositions in a thousand word sample, and the number of simple sentences in 75 sample sentences. Vogel and Washburne reported a correlation of .845 between their criterion and a readability formula based on these four elements. The best single indicator proved to be the number of different words per thousand.

Lewerenz (93) reported that words beginning with w, h, b, i or e bear some relation to difficulty. Words beginning with w, h anb b were found to occur with relative frequency in easy materials, while words beginning with i or e were relatively few.

In 1930, Johnson (84) estimated reading difficulty of children's materials by noting the percentage of polysyllabic words in a passage.

Patty and Painter (118), testing textbooks, modified the Lively-

Pressey method by multiplying the Thorndike index numbers of the words used in a sample passage by the relative frequency of the use of the respective words.

In 1933, Holland (77) investigated the effect of the length of sentence and number of simple sentences on silent reading.

McClusky (103) studied sentence length, frequency of polysyllables, frequency of technical terms, and number of common concrete nouns as related to comprehension.

In 1934, Dale and Tyler (22) reported the results of a study with adults of limited reading ability. The predictors correlating highest with difficulty were the number of different technical words, the number of different hard-non-technical words, the number of prepositional phrases, and the number of words beginning with i

Ojemann (112) found in a study of parent-teacher education materials that the number of prepositional phrases, the length of sentences, and vocabulary difficulty were significant factors.

A novel element was included in a procedure given by Lewerenz (92) in 1935. His formula included a measure of vocabulary interest as indicated by the number of colorful words, as well as measures of vocabulary diversity and difficulty.

In 1935, Gray and Leary (70) reported an investigation of the elements of difficulty in reading material for adults of limited reading ability. After

relating more than 40 different variables to reading comprehension test scores, they empirically chose five elements to predict readability: number of different hard words, number of personal pronouns, average sentence length in words, percentage of different words, and number of prepositional phrases.

Lorge (97) modified the Gray-Leary formula and used only number of different hard words, number of prepositional phrases, and average sentence length in words.

In 1943, Flesch (49) introduced a formula for predicting readability using the average sentence length in words, the number of personal references, and the number of affixes in the sample. This formula was based on research done at the Readability Laboratory of the American Association for Adult Education, an organization engaged in the production of a series of non-fiction books for mass consumption. Most of the readability measures available before the Flesch report were developed on children's reading materials. For the most part, they correlate very poorly with judges' ratings when applied to adult literature. The Flesch formula was designed specifically for gauging the readability of adult material and judges' ratings of difficulty were used as the criterion.

As a result of further research, Flesch (39) modified the original formula, chiefly by eliminating the count of affixes. The revised procedure has two parts. One part, designed to give a score of reading ease, is

based on the average number of words per sentence and the average number of syllables per word.[1] The other part of the procedure is an estimate of the human interest for the reader, based on the relative number of personal words and sentences.

The Flesch formulas have appeared in popularized versions as well as in the language of the professional journals. They have accordingly enjoyed great vogue. More than 100 articles have appeared since Flesch's original work, either discussing or applying Flesch's recommendations for writing readable prose.

Over a dozen of these articles deal directly with the reliability and validity of the Flesch formulas. They consistently report satisfactory reliability and validity. Consider for example the studies of Gilinsky and of Hayes, Jenkins, and Walker.

Gilinsky (68) tested the validity of the Flesch formulas against a scale of judged readability. Seventy-five samples of prose from various sources were rated by 15 college students for reading ease according to Thurstone's method of equal appearing intervals. The median judged values were correlated with the Flesch count. To avoid the objection that judgments do not separate difficulty of content from difficulty of style, a number of passages about the same subject matter were written by the researcher's colleagues in their usual style. These passages were also

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[1]It is curious to note that the measurement of readability used by Kitson in 1921 is the essential equivalent of this portion of the revised Flesch procedure.

rated for reading ease and the ratings used as a validity criterion for the Flesch index. Gilinsky found correlations between readability judgments and Flesch counts ranging from .61 to .84, indicating that the Flesch index is a highly valid index of readability.

Hayes, Jenkins, and Walker (75) reported a pair of studies of the analyst-to-analyst reliability of the Flesch formulas for predicting readability. In the first study, sample materials were analyzed by experienced and inexperienced Flesch analysts and the results compared. In the second study another set of materials was analyzed by two inexperienced student groups to get an index of "test-retest" reliability. The results from both studies indicated high reliability on word length, sentence length, and reading ease; fair reliability on personal words; and lower reliability on personal sentences than might ordinarily be considered reliable

TYPICAL APPLICATIONS OF THE FLESCH READABILITY FORMULAS

The formulas developed by Flesch have received widespread attention in many areas of communication. They have been applied in the fields of journalism, advertising, industrial communications, governmental publications, technical and professional publications, broadcasting and other areas. The wide range of applications can be illustrated with the following sample studies.

Swanson (131) demonstrated that making a long newspaper article more readable made for the readership of a larger number of paragraphs. This experimenter used a split-run technique. Two versions of an article were published in a campus newspaper and not in any other source. They differed only in readability. Statistical analysis yielded the conclusion that people read farther in the easier version.

Paterson and Walker (117) analyzed 34 Minnesota house organs by means of the Flesch procedure. Their analysis showed that the level of reading difficulty was too high for the rank and file reader, while the human interest value was too low to insure maximum reader interest.

Miller (108) applied the original Flesch formula to a select group of children's books (the first 23 winners of the Newbury Prize). The Flesch formula placed these books above the comprehension level of elementary school children.

Farr (32) discusses the problem of producing a readable handbook

for rank and file employees with limited education. He illustrates by showing the process and results of analyzing and revising a proposed employee handbook for a textile firm.

Steven and Stone (128) tested 18 psychological reference books with the original Flesch formula. With only one notable exception the ranking of books by the formula agreed with students' judgments as to reading difficulty.

Irvine (79) points out that the writing of government agencies has been called gobbledygook because of the incomprehensible character of much of it. He reports on the establishment of a government writer's workshop by the State of Alabama. The purpose of this workshop was to teach editors of government publications how to use the principles of clear writing recommended by Flesch. Irvine gives numerous examples of the simplified writing of government bulletins and other communications to illustrate the application of these ideas.

White (156) applied the revised Flesch readability yardstick to five well known historical documents and speeches such as the Constitution of the United States, and Washington's Farewell Address. These "American Scriptures" rated "fairly poor" to "poor" in readability, with the exception of Paine's The Crisis.

Siegel and Siegel (126) applied the Flesch formulas to the major pre-election speeches of Eisenhower and Stevenson, as reported in the

Philadelphia Inquirer. The evidence indicated that the speeches of both candidates were of the same level of difficulty, although there was a slight tendency for Eisenhower's speeches to be more interesting.

PROCEDURE

The Flesch procedure was selected for use in the study being reported here for several reasons. The Flesch formulas were developed specifically for adult materials, rather than for children's literature. Their validity and reliability have been checked by several investigators. They have been applied widely and are thus familiar to many. Finally, the Flesch procedure is simple and economical of time.

The eight publications analyzed in the study were ones which the enlisted man who is average or below average in literacy skills might be required to read. They included the basic texts for recruit training, training manuals for certain job fields, and the informational magazines published by the Bureau of Naval Personnel. These publications are briefly described below.

According to its foreword, The Bluejackets' Manual (141) is "a source of practical information for the seaman." It covers "the naval subjects presently required of the recruit and the non-rated man and, where possible, shows the avenues for further study." The Bluejackets' Manual is the basic training manual used by recruits and is thus in the category of expected reading for each of them.

Training manuals for four of the Navy occupational groups with low GCT (General Classification Test) requirements were studied. The reasoning here was that seamen within the first three pay grades would need

to read materials at least this difficult to advance in rank. These four training manuals were Stewardsman (149), Fireman (145), Steward and Cook 3C & 2C (148), and Commissaryman 3 & 2 (144).

This is Your Navy, An Informal History (122), is an enlarged version of a manual on naval history prepared during World War II. Although the revised version does not specifically repeat the statement, the preface to the 1946 edition said, "This book is written for all enlisted men of the U. S. Navy." It is doubtful that all men in the Navy are expected to read this history, but it does serve as an auxiliary text in recruit training.

A magazine slanted more specifically toward the average sailor is the BuPers information bulletin, All Hands (142, 143). This is published monthly "for the information and interest of the naval service as a whole."

Naval Training Bulletin (146, 147) is a monthly publication of the Bureau of Naval Personnel. It is circulated widely to serve primarily as resource material for the men in local training offices.

Flesch's book, How to Test Readability (45), served as the guide for this study. The only departure from his recommended procedure was to take a larger sample. Flesch indicates that 25 to 30 passages of 100 words each are sufficient. Full page samples were used in this study. All pages to be tabulated were selected by using a table of random numbers. The size of the sample for each of the eight publications is shown as part of Table 1. In every case 20 to 23 pages were used. Tabulation

started with the first complete sentence on each page in the sample and ended with the last full sentence on the page.

A separate analysis was made of the seven feature divisions in All Hands. A smaller sample was used in this analysis. Pages and paragraphs to be tabulated were selected within each of the seven divisions by using a table of random numbers. The size of the sample for each division is shown as part of Table 2. Two samples were taken of each feature. Each sample ended with the sentence contributing to the nearest 100 words. The figures of Table 2 represent averages of these two samples.

The quantities used in the reading ease and in the human interest formulas are also given in Tables 1 and 2. The reading ease formula requires: (a) sentence length, i.e., number of words per sentence; and (b) word length expressed in number of syllables per 100 words. The human interest score is based upon: (a) personal words per 100 words; and (b) personal sentences per 100 sentences. Personal words include personal pronouns and other words which have masculine or feminine natural gender, e.g., Mary, father, milkman, actress. Personal sentences include quotations, exclamations, sentence fragments, and sentences addressed directly to the reader.

Appendices A through H list, by pages sampled, the quantities used in the reading ease and the human interest formulas. Examination of these raw data yields some appreciation for the variation in readability within

TABLE 1. STATISTICS USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR EIGHT NAVY PUBLICATIONS

Publication	Pages in publication	Pages in sample	Words per sentence (w)	Syllables per 100 words (s)	Personal words per 100 words (x)	Personal sentences per 100 sentences (y)
Bluejackets' Manual	747	23	14.1	154.3	2.9	23.5
Stewardsman	189	20	9.2	137.2	3.2	67.5
Fireman	291	20	17.5	154.4	1.5	18.2
Steward and Cook 3C & 2C	171	20	12.0	137.3	3.1	48.9
Commissaryman 3 & 2	222	20	14.0	143.7	1.5	43.8
This is Your Navy	726	22	14.6	158.8	6.1	10.8
All Hands (2 issues combined)	128	21	19.1	169.4	4.3	8.3
Naval Training Bulletin (2 issues combined)	48	20	22.1	169.8	3.1	8.5

TABLE 2. STATISTICS USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR SEVEN FEATURES IN ALL HANDS

Feature	Words in sample	Words per sentence (w)	Syllables per 100 words (s)	Personal words per 100 words (x)	Personal sentences per 100 sentences (y)
The Word	183	26.1	208.7	0.5	0.0
Letters to the Editor	202	15.5	182.2	6.9	30.8
Today's Navy	224	22.4	176.3	0.4	0.0
Bulletin Board	197	28.1	173.6	5.6	57.1
Book Reviews	192	19.2	158.3	3.1	20.0
Book Supplement	210	23.3	137.1	2.4	0.0
Taffrail Talk	225	17.3	143.1	2.2	7.7

each of the volumes studied.

Using the quantities given in Tables 1 and 2, the reading ease and human interest scores were calculated. The reading ease score (RE) is found with this formula:

$$RE = 206.835 - (1.015\ w + .846\ s),$$

where w represents the average sentence length and s is the number of syllables per 100 words.

The human interest score (HI) is given by:

$$HI = 3.635\ x + .314\ y,$$

where x is the number of personal words per 100 words and y is the number of personal sentences per 100 sentences.

Each of these formulas yields a score ranging from 0 to 100. A score of 100 on the reading ease scale corresponds to very easy reading and a score of 100 on the human interest scale indicates highly interesting material. Correlational studies using standardized reading tests and the readability formulas have made it possible to translate readability scores into approximate grade level equivalents.

FINDINGS

The two Flesch formulas were applied to the data of Tables 1 and 2 to determine a reading ease score and a human interest score for each publication. Table 3 presents the reading ease scores for the eight publications.

Of the eight publications studied, only four were rated below the high school level in reading difficulty. These four were The Bluejackets' Manual and the training manuals, Stewardsman, Steward and Cook 3C & 2C, and Commissaryman 3 & 2. All Hands and The Naval Training Bulletin were rated as the equivalent of college material in difficulty. The remaining two publications were scored as the equivalent of high school material.

Table 4 presents the human interest scores for the same publications.

None of the eight publications rated as "dramatic" or "highly interesting." In fact, only two (Stewardsman and Steward and Cook 3C & 2C) rated as high as "interesting." The remaining six were "mildly interesting."

Table 5 presents the reading ease scores for the seven feature articles in All Hands.

Of the seven features, only two were rated below the high school level in reading difficulty. These two were "Book Supplement" and "Taffrail Talk." "The Word" was found to be extremely difficult reading.

TABLE 3. READING EASE SCORES FOR EIGHT NAVY PUBLICATIONS

Publication	Reading Ease Score	Grade Level Equivalent*	Description of Style
Bluejackets' Manual	62.0	9	Standard
Stewardsman	81.4	6	Easy
Fireman	58.5	High school	Fairly Difficult
Steward and Cook 3C & 2C	78.5	7	Fairly Easy
Commissaryman 3 & 2	71.1	7	Fairly Easy
This is Your Navy	57.7	High school	Fairly Difficult
All Hands	44.1	College	Difficult
Naval Training Bulletin	40.8	College	Difficult

*Flesch gives the following table converting reading ease scores to grade levels (How to Test Readability, p. 43):

Score	Grade
90 to 100	5th grade
80 to 90	6th grade
70 to 80	7th grade
60 to 70	8th and 9th grade
50 to 60	High school
30 to 50	College
0 to 30	College graduate

TABLE 4. HUMAN INTEREST SCORES FOR EIGHT NAVY PUBLICATIONS

Publication	Human Interest Score	Description of Style*
Bluejackets' Manual	17.9	Mildly Interesting
Stewardsman	32.8	Interesting
Fireman	11 2	Mildly Interesting
Steward and Cook 3C & 2C	26 6	Interesting
Commissaryman 3 & 2	19.2	Mildly Interesting
This is Your Navy	25.6	Mildly Interesting
All Hands	18.2	Mildly Interesting
Naval Training Bulletin	13.9	Mildly Interesting

*Flesch gives the following verbal descriptions of human interest scores (How to Test Readability, p. 10):

Score	Description
60 to 100	Dramatic
40 to 60	Highly Interesting
20 to 40	Interesting
10 to 20	Mildly Interesting
0 to 10	Dull

TABLE 5. READING EASE SCORES FOR SEVEN FEATURE DIVISIONS IN ALL HANDS

Feature	Reading Ease Score	Grade Level Equivalent	Description of Style
The Word	3.7	College Graduate	Very Difficult
Letters to the Editor	36.9	College	Difficult
Today's Navy	34.9	College	Difficult
Bulletin Board	31.4	College	Difficult
Book Reviews	53.4	High School	Fairly Difficult
Book Supplement	67.1	9	Standard
Taffrail Talk	68.2	9	Standard

Table 6 presents the human interest scores for the seven feature divisions in All Hands.

Only two of the features, "Letters to the Editor" and "Bulletin Board," were rated as high as "interesting"; "Book Reviews" and "Taffrail Talk" were rated as "mildly interesting"; "The Word," "Today's Navy," and "Book Supplement" were rated as "dull."

TABLE 6. HUMAN INTEREST SCORES FOR SEVEN FEATURE DIVISIONS IN ALL HANDS

Feature	Human Interest Score	Description of Style
The Word	2.0	Dull
Letters to the Editor	34.9	Interesting
Today's Navy	1.6	Dull
Bulletin Board	38.2	Interesting
Book Reviews	17.6	Mildly Interesting
Book Supplement	8.7	Dull
Taffrail Talk	10.5	Mildly Interesting

DISCUSSION

Present literacy standards for the Navy require that enlisted men be able to read at the fourth-grade level before beginning recruit training. Men inducted into the Navy who do not measure up to this criterion of literacy are given special literacy training. When these men are able to read at the fourth-grade level, they are advanced to regular recruit training. Those failing to achieve this standard of literacy are released from the service. If fourth-grade reading ability is the goal of literacy instruction, then materials pitched far above fourth-grade difficulty must be ineffective aids to learning for these marginally literate recruits. All of the publications involved in this study rated as too difficult for the marginally literate personnel in the Navy.

Flesch feels that the human interest element may be more important than the index of reading ease. The eight publications studied did not rate very high on the interest scale either. It is worthwhile to notice that the two publications rated as "interesting" were also scored as the two easiest to read.

It may be that the authors of these publications were directing their efforts toward an audience of average recruits rather than one of marginally literate recruits. The reading ability level of the average recruit does not seem to be known. An estimate based on census data would probably fix this quantity slightly above the ninth-grade level. Even by this standard,

four of the publications are too difficult.

The authors of the training manual for Stewardsman, and Steward and Cook 3C & 2C seem to have written with a conscious attempt to present their material in a form easily understood by seamen with limited reading ability. Evidence of this can be found in the relatively high reading ease and human interest scores of these books. As stated earlier, there are many factors not in the Flesch formulas which probably contribute to readability. For example, illustrated material is usually judged easier and more interesting than the same material without the illustrations. The Stewardsman and Steward and Cook 3C & 2C Training Manuals are illustrated with photographs and sketches to an extent not found in the other publications.

Separate analysis of All Hands, the "house organ" publication for all levels of Navy personnel, revealed that there was considerable variation in reading difficulty between the seven feature divisions. "The Word" was found to be extremely difficult reading. The two easiest features were "Book Supplement" and "Taffrail Talk," which were both rated as ninth-grade reading.

None of the feature divisions, however, were within the goals of literacy training--fourth-grade reading ability. Thus, all of these feature sections are too difficult for the marginally literate personnel in the Navy.

The seven feature sections had some variation in interest level, but

none was rated very high on this scale either. "The Word," "Today's Navy," and "Book Supplement" were all rated as "dull." Only "Letters to the Editor" and "Bulletin Board" rated as high as "interesting."

The message of each of these eight publications could be presented in a manner which would prove more readable and more interesting for the marginally literate recruit. The basic rule for achieving this end is constantly to remember the audience when writing a passage, rather than to write so as to conform to some standard of literary style. With the audience in mind, the secondary rules become almost automatic. To enhance readability one uses shorter sentences, simpler words, more illustrative examples, more practical applications, and more illustrations. A conversational approach, written as though it were to be read orally, increases interest. Emphasizing important points and eliminating unessentials helps insure that the reader gets the message. The reader can be further aided with a logical arrangement of ideas building up to the central thought.

The following example is offered to illustrate how the readability of these Navy publications might be improved. Consider this paragraph from The Bluejackets' Manual (page 127).

> Intelligent care of one's clothing is recommended for reasons of economy and preparedness. Not only will you save money by keeping your clothes in good repair, but there may be times when uniform replacements will not be available, and then you will be glad to have your older uniforms looking presentable. The

> information contained in this section is presented in order that the useful life of uniforms and equipment may be prolonged and also that they may be worn with the justifiable pride which should distinguish a naval or military uniform. No matter how well fitting a uniform is when new, especially the coat, it will not continue to look its best or keep its shape unless it is carefully put on and kept buttoned. The carrying of large or heavy objects in the pockets soon destroys the shape of the best uniform. Uniforms should always be kept on hangers when not in use.

This paragraph contains 154 words, 238 syllables, 6 sentences, 4 personal words, and 1 personal sentence. It borders between difficult and "fairly difficult." The reading ease score of 50.0 shows it to be twelveth-grade material. The human interest score is 14.7 "mildly interesting."

A revised paragraph, which follows, does not alter the context or omit any ideas of the original example. It differs only in that it employs shorter sentences and simpler words.

> Care of one's clothing is wise for two reasons. First, you will save money by keeping your clothes in good shape. Second, there may be times when uniform replacements will not be available. Then you will be glad to have your older uniforms looking trim. If it is properly cared for, a naval or military uniform can be worn with justifiable pride. This section will help you do this.
>
> No matter how well a new uniform fits, it must be cared for if it is to continue to look its best. This is especially true of the coat. These rules will help. Put on the uniform carefully; keep it buttoned. Otherwise, it will lose its shape. Don't put large or heavy objects in your pockets. Always keep uniforms on hangers when not in use.

The revised paragraph contains 134 words, 185 syllables, 14 sentences, 6 personal words, and 7 personal sentences. Its reading ease score of 80.3 fixes it on the sixth-grade level with an "easy" rating. The human interest score has been raised to 32.0, "interesting." This revision is far from the ultimate in either readability or literary style. Further improvements, of course, can be made in both directions without being artificial. It does emphasize the fact that many current Navy publications could (and should) be rewritten with more consideration for their readers, some of whom are only marginally literate.

SUMMARY

This study was initiated to determine the readability of certain Navy publications which an enlisted man might normally be expected to read. Eight publications were analyzed by means of the Flesch formulas for measuring readability.

Present minimal literacy standards for the Navy require that men be able to read at the fourth-grade level. All of the publications involved in this study were gauged as too difficult for the marginally literate personnel in the Navy. Suggestions were made for the rewriting of materials so as to make them more interesting and comprehensible.

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APPENDIX A

DATA USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR THE BLUEJACKETS' MANUAL

Page	Number of Words	Number of Sentences	Number of Syllables	Number of Personal Words	Number of Personal Sentences
011	354	27	571	23	6
019	154	13	221	15	10
067	-	-	-	-	-
135	296	22	430	6	70
191	333	30	496	15	5
220	254	12	373	21	1
232	77	4	124	1	0
240	218	25	425	1	10
266	333	24	447	0	9
284	344	22	443	20	0
438	133	10	242	0	0
454	262	16	475	4	5
482	303	23	420	7	12
511	306	19	525	3	2
515	256	15	384	18	0
579	346	15	551	0	0
602	-	-	-	-	-
613	210	16	275	0	2
614	55	9	71	0	9
627	54	3	70	1	0
655	352	27	552	3	0
660	155	9	242	6	0
715	193	13	360	2	0

APPENDIX B

DATA USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR THE STEWARDSMAN

Page	Number of Words	Number of Sentences	Number of Syllables	Number of Personal Words	Number of Personal Sentences
002	-	-	-	-	-
045	98	9	140	0	2
047	99	10	129	7	10
054	42	7	55	1	7
056	125	11	187	9	8
058	91	13	116	0	9
083	14	2	20	1	1
092	102	16	154	0	15
110	136	10	172	6	2
121	95	11	133	2	10
135	-	-	-	-	-
143	69	11	91	0	10
156	41	3	63	0	0
168	58	6	77	0	6
172	93	11	130	2	8
180	128	13	166	5	5
182	85	10	121	4	5
184	105	9	150	1	2
190	-	-	-	-	-
202	83	8	105	9	8

APPENDIX C

DATA USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR THE FIREMAN

Page	Number of Words	Number of Sentences	Number of Syllables	Number of Personal Words	Number of Personal Sentences
064	341	21	519	0	0
068	59	5	80	0	0
069	387	20	548	1	0
073	386	20	551	1	1
074	123	7	192	2	3
077	89	5	128	0	0
111	-	-	-	-	-
122	338	20	527	1	2
128	200	10	275	4	2
144	180	9	294	1	1
158	343	17	541	3	0
160	57	3	82	0	0
164	164	11	280	3	4
168	361	17	560	2	3
195	178	11	300	8	4
207	350	24	554	2	2
217	271	20	552	0	2
242	259	14	397	16	8
246	170	9	258	10	6
274	358	21	488	16	10

APPENDIX D

DATA USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR THE STEWARD AND COOK 3C & 2C

Page	Number of Words	Number of Sentences	Number of Syllables	Number of Personal Words	Number of Personal Sentences
001	155	12	202	10	6
008	160	13	202	5	6
023	137	11	189	4	7
042	316	26	430	1	4
051	44	3	58	2	2
069	299	21	434	10	19
074	263	29	373	7	19
075	315	26	452	17	9
077	189	17	278	6	5
102	85	3	104	0	3
104	15	1	22	0	1
111	32	2	46	0	2
112	53	3	70	1	3
118	48	3	64	0	2
134	112	9	146	1	2
136	133	11	177	2	1
161	298	21	414	12	15
165	229	15	304	6	12
169	208	25	280	7	6
176	209	23	285	12	10

APPENDIX E

DATA USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR COMMISSARYMAN 3 & 2

Page	Number of Words	Number of Sentences	Number of Syllables	Number of Personal Words	Number of Personal Sentences
009	205	17	460	14	1
021	323	14	481	2	2
041	389	28	517	6	18
042	363	26	457	1	7
045	135	10	148	0	4
053	194	12	285	4	4
083	141	11	198	1	4
090	82	7	115	0	1
117	-	-	-	-	-
140	61	3	83	0	3
148	27	2	37	0	2
150	31	3	43	0	2
154	50	4	73	0	3
161	129	9	171	1	2
165	319	23	447	6	12
179	236	18	299	4	11
186	319	22	479	3	7
187	300	29	447	0	20
200	189	15	310	10	13
205	378	23	514	8	5

APPENDIX F

DATA USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR THIS IS YOUR NAVY

Page	Number of Words	Number of Sentences	Number of Syllables	Number of Personal Words	Number of Personal Sentences
018	394	29	609	27	1
026	376	24	581	24	1
039	386	29	616	19	11
070	410	26	605	5	1
072	386	34	634	24	7
084	419	27	680	44	3
101	-	-	-	-	-
226	371	33	580	36	4
317	355	16	563	45	8
348	387	27	586	33	6
353	363	23	610	8	1
366	375	20	621	13	0
433	368	23	591	23	0
451	428	30	620	35	2
504	367	24	590	29	4
537	330	25	504	16	0
538	344	36	570	2	2
551	352	21	591	27	0
585	396	18	650	10	0
633	322	18	560	13	4
634	389	29	587	31	3
645	311	23	483	17	0

APPENDIX G

DATA USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR ALL HANDS

Page	Number of Words	Number of Sentences	Number of Syllables	Number of Personal Words	Number of Personal Sentences
Oct.					
5	501	27	749	12	6
19	334	16	615	8	0
23	1110	77	1878	44	7
24	1074	67	1844	45	2
26	1259	73	2172	49	1
27	1038	61	1757	40	1
39	644	28	1151	13	3
42	558	24	1007	17	0
46	798	38	1610	25	5
53	567	36	1062	38	1
57	573	28	1132	14	0
Nov.					
8	722	37	1202	25	6
16	553	32	935	24	2
18	501	29	840	44	9
29	570	27	1025	83	0
34	1067	48	1749	33	8
36	773	37	1196	17	0
42	760	39	1294	18	2
49	926	36	1536	56	17
60	780	38	1118	34	0
62	1085	48	1565	62	0

APPENDIX H

DATA USED TO CALCULATE THE READING EASE AND HUMAN INTEREST SCORES FOR THE NAVAL TRAINING BULLETIN

Page	Number of Words	Number of Sentences	Number of Syllables	Number of Personal Words	Number of Personal Sentences
Oct.					
1	481	19	812	1	1
7	820	33	1197	10	0
10	646	42	1158	11	0
11	611	28	1000	18	3
12	347	15	600	1	0
14	561	24	895	6	0
18	499	20	948	2	0
21	590	30	977	18	7
23	844	27	1319	43	21
24	544	18	817	27	8
Nov.					
2	753	33	1364	12	0
4	254	11	450	6	0
5	573	24	1069	20	1
11	588	21	1146	6	0
12	365	22	615	10	0
15	691	36	1170	45	0
18	865	43	1411	83	0
21	629	28	1037	16	1
24	673	28	1083	23	2
25	639	39	1260	11	2